

COMPLETE LISTING OF CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. – 14. (cancelled)

15. (withdrawn) A refrigerant filtration apparatus adapted for connection to a refrigerant system, said refrigerant filtration apparatus having an isolable first filter for providing filtration of component failure debris and a second filter for providing filtration during normal operation.

16. (withdrawn) A filtration apparatus comprising:

a filtration housing having a plurality of ports, said plurality of ports comprising at least one inlet port and at least one outlet port, each such port adapted for connection to a fluid system;

a first and a second circuit passage defined in the filtration housing, said first circuit passage comprising a first filter channel, said first and second circuit passage each providing selectable fluid communication between one of said at least one inlet port and one of said at least one outlet port;

a first filter disposed in the first filter channel and adapted to filter debris from fluids flowed through the a first filter channel; and

a flow path selection means disposed within the filtration housing and adapted to selectively direct fluid flow through one of a plurality of selectable flow paths, said plurality of selectable flow paths including the first circuit passage and the second circuit passage.

17. (withdrawn) The apparatus of Claim 16 further comprising:

a second filter channel disposed in the second circuit passage; and

a second filter disposed in the second filter channel and adapted to filter debris from fluids flowed through the second filter channel.

18. (withdrawn) The apparatus of Claim 17, wherein said first circuit passage further comprises said second filter channel.

19. (withdrawn) The apparatus of Claim 17, wherein said at least one inlet port comprises an inlet port, and

wherein, said first and second circuit passage each provide selectable fluid communication between said inlet port and one of said at least one outlet ports.

20. (withdrawn) The apparatus of Claim 17, wherein said at least one outlet port comprises an outlet port, and

wherein, said first and second circuit passage each provide selectable fluid communication between said at least one inlet ports and said outlet port.

21. (withdrawn) The apparatus of Claim 17, wherein, said at least one inlet port comprises a first circuit inlet port and a second circuit inlet port,

wherein, said at least one outlet port comprises a first circuit outlet port and a second circuit outlet port,

wherein, said first circuit passage provides selectable fluid communication between said first circuit inlet port and said first circuit outlet port, and

wherein, said second circuit passage each providing selectable fluid communication between said second circuit inlet port and said second circuit outlet port.

22. (withdrawn) The apparatus of Claim 16, said primary filter comprising a filter selected from the group including a cup filter, a mesh filter, a cartridge filter and combinations thereof.

23. (withdrawn) The apparatus of Claim 17, said secondary filter comprising a filter selected from the group including a cup filter, a mesh filter, a cartridge filter, an orifice tube and combinations thereof.

24. (withdrawn) The apparatus of Claim 16, the flow path selection means having a first position adapted to selectively direct fluid flow into the first circuit

passage and a second position adapted to selectively direct fluid flow into the second circuit passage.

25. (withdrawn) The apparatus of Claim 24, said flow path selection means comprising a diverter valve.

26. (withdrawn) The apparatus of Claim 25, said diverter valve comprising a ball valve.

27. (withdrawn) The apparatus of Claim 16, wherein said primary filter has a primary filter interior region adapted to retain debris, and

wherein, the flow path selection means has a primary position adapted to selectively direct fluid flow through the first circuit passage, and

wherein, the flow path selection means has a secondary position adapted to selectively prevent fluid flow through the first circuit passage and is further adapted to retain between the flow selector means and the primary filter such debris as is retained within said primary filter interior region.

28. (withdrawn) The apparatus of Claim 24, wherein the flow path selection means comprises an automatic flow path selection means.

29. (withdrawn) The apparatus of Claim 28, the automatic flow path selection means having a shifting parameter comprising a selected differential pressure across the first filter, wherein, with the flow path selection means selected to direct fluid flow into the first circuit passage so as to generate a dynamic differential pressure across the first filter, and with the dynamic differential pressure across the first filter equal to or exceeding the selected differential pressure across the first filter, the dynamic differential pressure causes the automatic flow path selection means to shift from said first position to said second position.

30. (previously presented) A method of filtering entrained debris from the refrigerant of a refrigerant system, the method comprising the steps of:

(a) providing a refrigerant system comprising a high pressure side including a compressor, a condenser and a flow reducing device;

(b) providing a refrigerant filtration apparatus comprising:

a filtration housing having an inlet port and an outlet port, each port adapted for connection to a refrigerant system;

a primary circuit passage defined in the filtration housing and selectably providing fluid communication between the inlet port and the outlet port, the primary circuit passage comprising:

a primary filter channel; and

a primary filter disposed in the primary filter channel and adapted to filter debris from refrigerant flowed through the primary filter channel;

a secondary circuit passage defined in the filtration housing and selectably fluid providing communication between the inlet port and the outlet port, the secondary circuit passage comprising:

a secondary filter channel; and

a diverter means disposed within the filtration housing and operably adapted to selectively direct refrigerant flow through either the primary circuit passage or the secondary circuit passage;

(c) installing the refrigerant filtration apparatus in the refrigerant system high pressure side;

(d) operating the diverter means so as to direct refrigerant flow to the primary circuit passage;

(e) operating the refrigerant system until a shifting parameter is obtained; and

(f) operating the diverter means so as to direct refrigerant flow to the secondary circuit passage.

31. (previously presented) The method of Claim 30, wherein, the secondary circuit passage comprising of step (a) further comprises a secondary filter disposed

in the secondary filter channel and adapted to filter debris from refrigerant flowed through the secondary filter channel.

32. (previously presented) The method of Claim 30, wherein step (c) further comprises installing the refrigerant filtration apparatus downstream of the condenser.

33. (previously presented) The method of Claim 30, wherein the shifting parameter comprises a selected elapsed time of operation of the refrigerant system after reaching normal operating temperatures, and

wherein step (e) further comprises:

operating the refrigerant system for a sufficient time for the refrigerant system to reach normal operating temperatures; and

operating the refrigerant system for said selected elapsed time of operation after reaching normal operating temperatures.

34. (previously presented) The method of Claim 33, wherein said refrigerant system comprises an air conditioning refrigerant system, and

wherein, said selected elapsed time of operation comprises an elapsed time of operation of between about fifteen minutes and about three hours after reaching normal operating temperatures.

35. (previously presented) The method of Claim 34, wherein, said selected elapsed time of operation comprises an elapsed time of operation of about one hour after reaching normal operating temperatures.

36. (previously presented) The method of Claim 30, wherein the shifting parameter comprises a selected total elapsed time of operation of the refrigerant system, and

wherein step (e) further comprises operating the refrigerant system for said selected total elapsed time of operation.

37. (previously presented) The method of Claim 36, wherein said refrigerant system comprises an air conditioning refrigerant system, and

wherein, said selected total elapsed time of operation comprises an total elapsed time of operation of between about thirty minutes and about four hours.

38. (previously presented) The method of Claim 30, wherein the shifting parameter comprises a selected differential pressure across the primary filter, and

wherein step (e) further comprises operating the air-conditioning refrigerant system until said selected differential pressure across the primary filter is obtained.

39. (previously presented) The method of Claim 38, wherein, said selected differential pressure across the primary filter comprises a differential pressure across the primary filter of between about 5 p.s.i.g. and about 20 p.s.i.g.

40. (previously presented) The method of Claim 39, wherein, said selected differential pressure across the primary filter comprises a differential pressure across the primary filter of about 8 p.s.i.g.

41. (previously presented) The method of Claim 38, wherein, diverter means is adapted to sense the differential pressure across the primary filter.

42. (previously presented) The method of Claim 38, wherein, diverter means comprises:

at a diverter valve;

at least one piezoelectric sensor disposed within the primary circuit passage and adapted to measure the differential pressure across the primary filter; and

an electronic activation means in electronic communication with the at least one piezoelectric sensor and adapted to operate said diverter valve.

43. (previously presented) The method of Claim 30, wherein said compressor has a normal compressor discharge pressure,

wherein, the shifting parameter comprises a selected compressor discharge pressure above said normal compressor discharge pressure, and

wherein step (e) further comprises operating the air-conditioning refrigerant system until said selected compressor discharge pressure above said normal compressor discharge pressure is obtained.

44. (previously presented) The method of Claim 43, wherein, said selected compressor discharge pressure above said normal compressor discharge pressure comprises a compressor discharge pressure of between about 5 p.s.i.g. and about 20 p.s.i.g. above said normal compressor discharge pressure.

45. (previously presented) The method of Claim 44, wherein, said selected compressor discharge pressure above said normal compressor discharge pressure comprises a compressor discharge pressure of about 8 p.s.i.g. above said normal compressor discharge pressure.

46. (withdrawn) A filtration apparatus comprising:

a filtration housing having a plurality of ports, said plurality of ports comprising at least one inlet port and at least one outlet port, each such port adapted for connection to a fluid system;

a first and a second circuit passage defined in the filtration housing, said first and second circuit passage each providing selectable fluid communication between

one of said at least one inlet port and one of said at least one outlet port, said first circuit passage comprising a primary filter channel;

a flow path selection means comprising a primary piston assembly, said primary piston assembly disposed in said primary filter channel and adapted for movement from a retained position to a sealed position; and

a primary filter disposed within said primary filter channel and adapted to filter debris from fluids flowed through said primary filter channel,

wherein, with said primary piston assembly being disposed in said retained position, said flow path selection means is adapted to direct fluid to flow through said primary circuit passage,

wherein, with said primary piston assembly being disposed in said sealed position, said primary piston assembly is adapted so as to block fluid flow through said primary circuit, and said primary piston assembly and primary filter channel cooperate so as to encapsulate said primary filter, and

wherein, with said primary piston assembly being disposed in said sealed position, said flow path selection means is adapted to direct fluid to flow through said secondary circuit passage.

47. (withdrawn) The apparatus of Claim 46, wherein said primary filter channel further comprises a primary filter channel inlet and a primary filter channel outlet,

wherein, said primary piston assembly comprises:

a primary piston face;

a primary piston cylinder having an interior channel said primary filter being further disposed within said interior channel;

an interior channel inlet and an interior channel outlet, said interior channel providing fluid communication between said interior channel inlet and said interior channel outlet, and

wherein, with said primary piston assembly being disposed in said retained position, said interior channel inlet and said interior channel outlet are configured to allow fluid communication between said primary filter channel inlet and said primary filter channel outlet.

48. (withdrawn) The apparatus of Claim 47, wherein said primary filter channel further comprises an interior channel inlet sealing surface and an interior channel outlet sealing surface, and

wherein, with said primary piston assembly being disposed in said sealed position, said interior channel inlet sealing surface and said interior channel outlet sealing surface receive said interior channel inlet and said interior channel outlet respectively so as to encapsulate said primary filter.

49. (withdrawn) The apparatus of Claim 46 further comprising a primary piston alignment means adapted to prevent rotation of said primary piston assembly.

50. (withdrawn) The apparatus of Claim 49, wherein said primary piston alignment means comprises:

an alignment guide disposed within the primary filter channel and extending toward said primary piston cylinder; and

an alignment channel axially disposed in the primary piston cylinder, said alignment channel receiving said alignment guide so as to allow translational movement of said piston assembly and so as to prevent rotational movement of said piston assembly.

51. (withdrawn) The apparatus of Claim 46, wherein, said second circuit passage comprises a secondary filter channel having a secondary filter disposed therein,

wherein, said flow path selection means further comprises a secondary piston assembly disposed in said secondary filter channel and adapted for movement from a retained position to a released position,

wherein, with said secondary piston assembly being disposed in said released position, said secondary piston assembly is adapted to direct fluid to flow through said secondary circuit passage, and

wherein, with said secondary piston assembly being disposed in said retained position, said secondary piston assembly is adapted to block fluid flow through said secondary circuit passage.

52. (withdrawn) The apparatus of Claim 51, wherein, said secondary filter channel comprises a secondary filter channel inlet,

wherein, said secondary piston assembly comprises a blow out plug adapted for positioning within said secondary filter channel inlet so as to block fluid flow through said secondary filter channel, and

wherein, with said blow out plug being disposed in a retained position within said secondary filter channel inlet, said blow out plug is adapted such that a differential pressure across said blow out plug exceeding a preset blowout differential pressure causes the blow out plug to move from a retained position to a released position.

53. (withdrawn) The apparatus of Claim 47, wherein, said flow path selection means further comprises a retention and release means,

wherein, with said primary piston assembly being disposed in said retained position, said primary filter channel is adapted such that fluids flowed through said primary filter cause a primary filter differential pressure across said primary filter,

wherein, with said primary piston assembly being disposed in said retained position and with said primary filter differential pressure being generally less than a selected primary filter differential pressure, said retention and release means is further adapted to prevent movement of said primary piston assembly from said retained position, and

wherein, with said primary filter differential pressure generally equaling or exceeding said selected primary filter differential pressure, said retention and release means is further adapted to allow movement of said primary piston assembly from said retained position.

54. (withdrawn) The apparatus of Claim 53, wherein, with said primary filter differential pressure generally equaling or exceeding said selected primary filter differential pressure and with said retention and release means allowing movement of said primary piston assembly from said retained position, said primary filter differential pressure causes a force differential to be exerted upon said piston face so as to move said piston assembly to the said sealed position.

55. (withdrawn) The apparatus of Claim 54, wherein, said flow path selection means further comprises a primary piston biasing spring disposed within said primary filter channel so as to bias said primary piston assembly.

56. (withdrawn) The apparatus of Claim 55, wherein, said primary piston biasing spring is disposed so as to bias said primary piston assembly toward said sealed position.

57. (withdrawn) The apparatus of Claim 53, wherein, said retention and release means comprises a differential pressure release assembly, said differential pressure release assembly having:

a detent portion; and

a first retention channel disposed in said primary piston cylinder,

wherein, with said primary piston assembly being disposed in said retained position, said first retention channel releasably receives and retains said detent portion, and

wherein, with said primary filter differential pressure generally equaling or exceeding said selected primary filter differential pressure, said detent portion is lifted from said first retention channel so as to allow movement of said primary piston assembly from said retained position.

58. (withdrawn) The apparatus of Claim 57, wherein, said detent portion comprises a spring loaded detent disposed in said primary filter channel and extending toward said primary piston cylinder, and

wherein, said first retention channel comprises a first detent channel disposed in said primary piston cylinder,

wherein, with said primary piston assembly being disposed in said retained position and with said primary filter differential pressure generally less than said selected primary filter differential pressure, said spring loaded detent is releasably received and retained within said first detent channel, and

wherein, with said selected primary filter differential pressure beings a differential pressure of between about 5 p.s.i.g. and about 20 p.s.i.g. and with said primary filter differential pressure generally equaling or exceeding said selected primary filter differential pressure, said primary filter differential pressure causes spring loaded detent to unseat from the first detent channel.

59. (withdrawn) The apparatus of Claim 58, wherein, with said selected primary filter differential pressure beings a differential pressure of about 8 p.s.i.g. and with said primary filter differential pressure generally equaling or exceeding said selected primary filter differential pressure, said primary filter differential pressure causes spring loaded detent to unseat from the first detent channel.

60. (withdrawn) The apparatus of Claim 57, wherein, said differential pressure release assembly further comprises a second retention channel disposed in said primary piston cylinder,

wherein, with said primary piston assembly being disposed in said sealed position, said second retention channel fixedly receives and retains said detent portion.

61. (withdrawn) The apparatus of Claim 57, wherein, said differential pressure release assembly further comprising:

a differential pressure piston having a high pressure face and a low pressure face, said high pressure face being in fluid communication with said interior channel inlet, said interior channel inlet having a interior channel inlet fluid pressure; and

a biasing spring disposed so as to bias said differential pressure piston toward said primary piston cylinder.

62. (withdrawn) The apparatus of Claim 61, wherein with said primary piston assembly being disposed in said retained position and with said interior channel inlet pressure generally less than said a selected inlet pressure, said differential pressure piston releasably biases said detent portion toward first retention channel, and

wherein, with said interior channel inlet fluid pressure generally equaling or exceeding said selected inlet pressure, said interior channel inlet fluid pressure causes the differential pressure piston to move away from said primary piston cylinder and lift said detent portion from said first retention channel so as to allow movement of said primary piston assembly from said retained position.

63. (withdrawn) The apparatus of Claim 61, wherein, said low pressure face is in fluid communication with said interior channel outlet, said interior channel outlet having a interior channel outlet fluid pressure; and

wherein, with said primary piston assembly being disposed in said retained position and with said primary filter differential pressure generally less than said selected primary filter differential pressure, said differential pressure piston releasably biases said detent portion toward first retention channel, and

wherein, with said primary filter differential pressure generally equaling or exceeding said selected primary filter differential pressure, said primary filter differential pressure causes the differential pressure piston to move away from said primary piston cylinder and lift said detent portion from said first retention channel so as to allow movement of said primary piston assembly from said retained position.

64. (withdrawn) The apparatus of Claim 6, whereinwherein, with said selected primary filter differential pressure beings a differential pressure of between about 5 p.s.i.g. and about 20 p.s.i.g. and with said primary filter differential pressure generally equaling or exceeding said selected primary filter differential pressure, said primary filter differential pressure causes the differential pressure piston to move away from said primary piston cylinder and lift said detent portion from said first retention channel so as to allow movement of said primary piston assembly from said retained position.